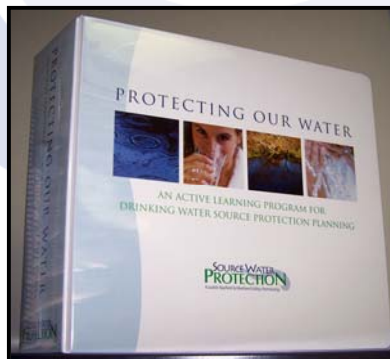


Working Group Curriculum Evaluation

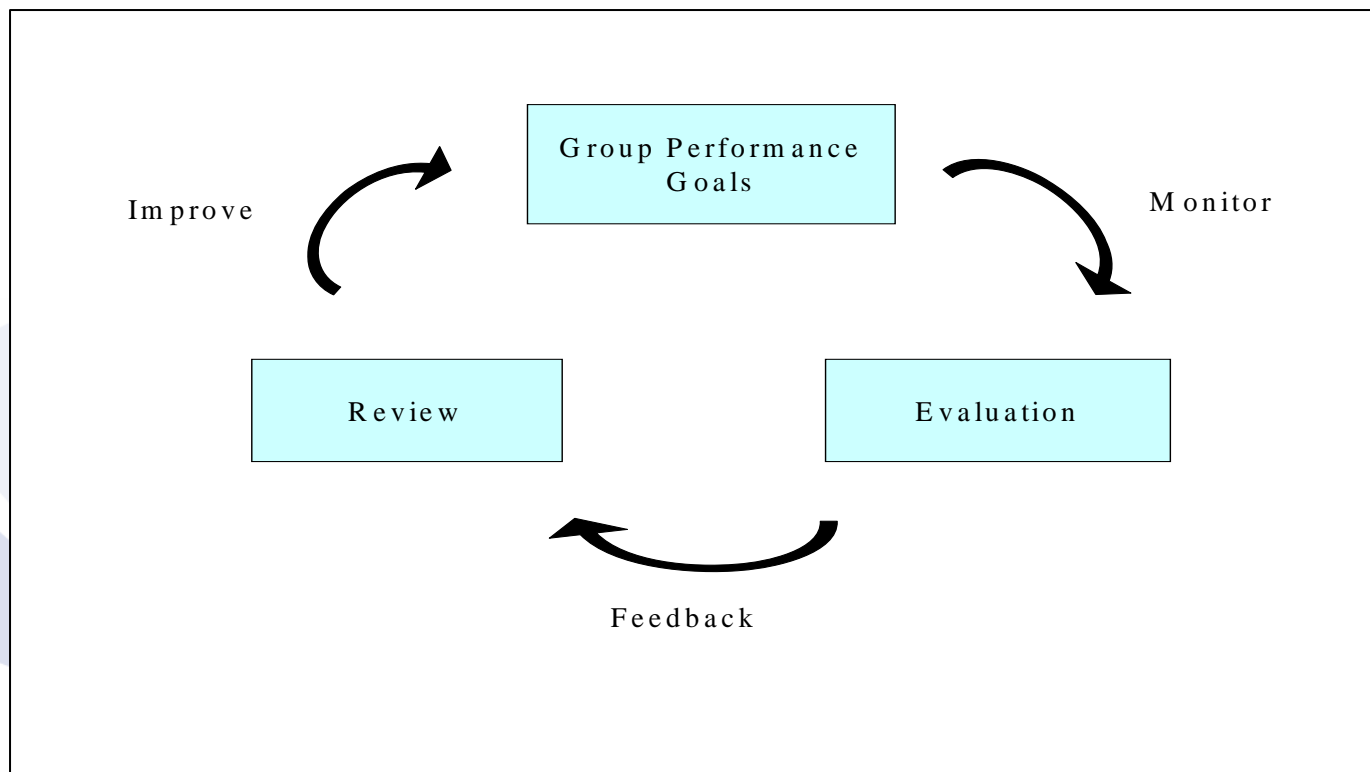
Adult Learning Program

Ausable Bayfield Maitland Valley

Drinking Water Source Protection



Snyder-Model Process Evaluation



Evaluation

- The group decides on goals that will reflect how they, as a team, would like to operate.
- What goals/foundational principles would enable a successful team?
- Process, outcome and short-cycle evaluation

Evaluation

- Snyder model, Guidebook prepared by Masters candidate Meredith Walker
- How well are my learning goals being met?
- Am I getting the information that I need?
- Are the strategies to sum up our key themes working?

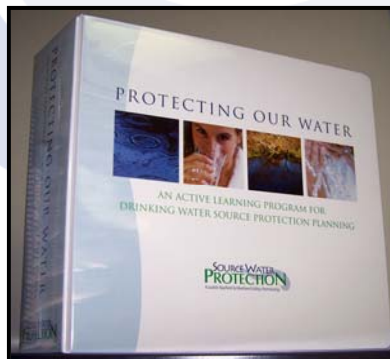
Working Group Curriculum Update

An Overview of Modules Nine and Ten

Adult Learning Program

Ausable Bayfield Maitland Valley

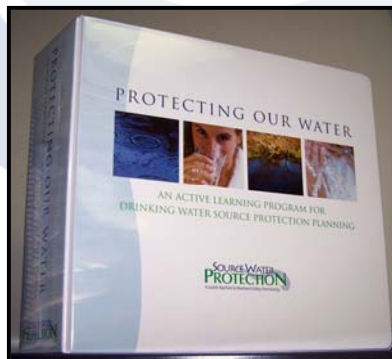
Drinking Water Source Protection



The Water Budget in Concept

An Overview of Module Nine

Adult Learning Program

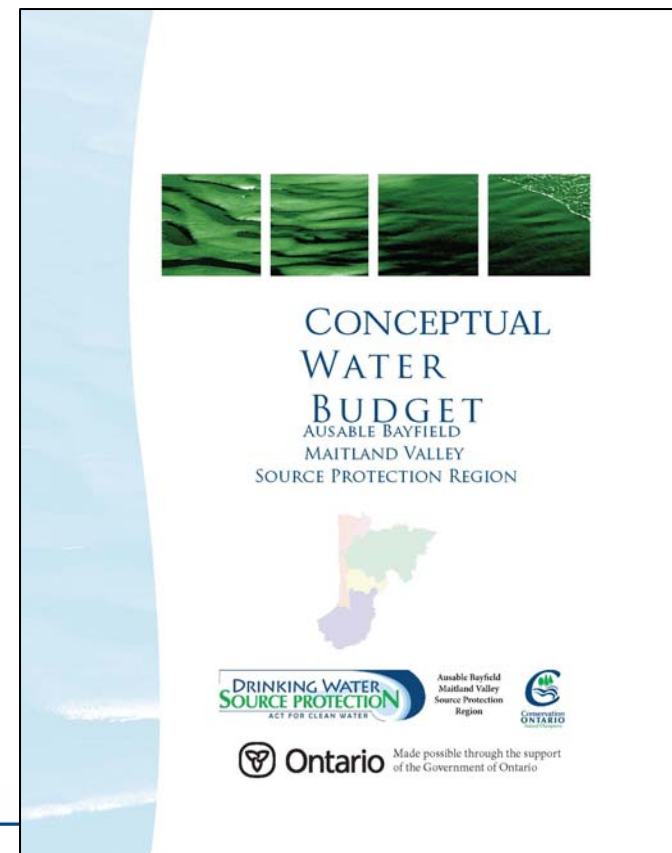


Module Nine: Water Budget in Concept Module Ten: Water Budgets for the Region

*These education modules
relate to technical
guidance:*

- Water Budget and Water Quantity Risk Assessment
- Conceptual Water Budget

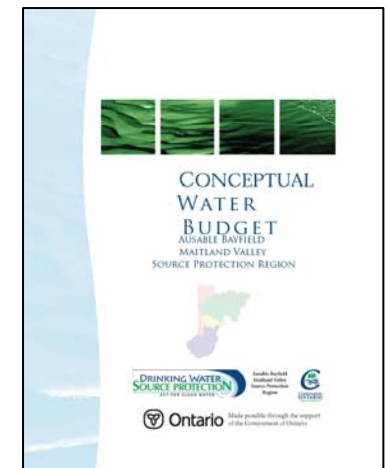
Modules 9 and 10: Water Budget



Conceptual Water Budget

(See Glossary, Page 4 and sourcewaterinfo.on.ca)

A conceptual water budget is a written description of the overall flow system dynamics for each watershed in the Source Protection Area, taking into consideration surface water and groundwater features, land cover (e.g., proportion of urban versus rural uses), human-made structures (e.g., dams, water crossings, channel diversions, and water takings.)



Learning Expectations

*By the end of **Session 9** you will be able to:*

- Understand the hydrological cycle from a new perspective
- Understand the meaning, purpose, and local implications of a water budget
- Demonstrate an understanding that a water budget is a tool to quantify water supply and demand and describe the movement and pathways of water
- Understand the relationship of water quantity and water quality
- Identify the water quantity pressures that affect the Ausable Bayfield Maitland Valley Source Protection Region

*By the end of **Session 10** you will be able to:*

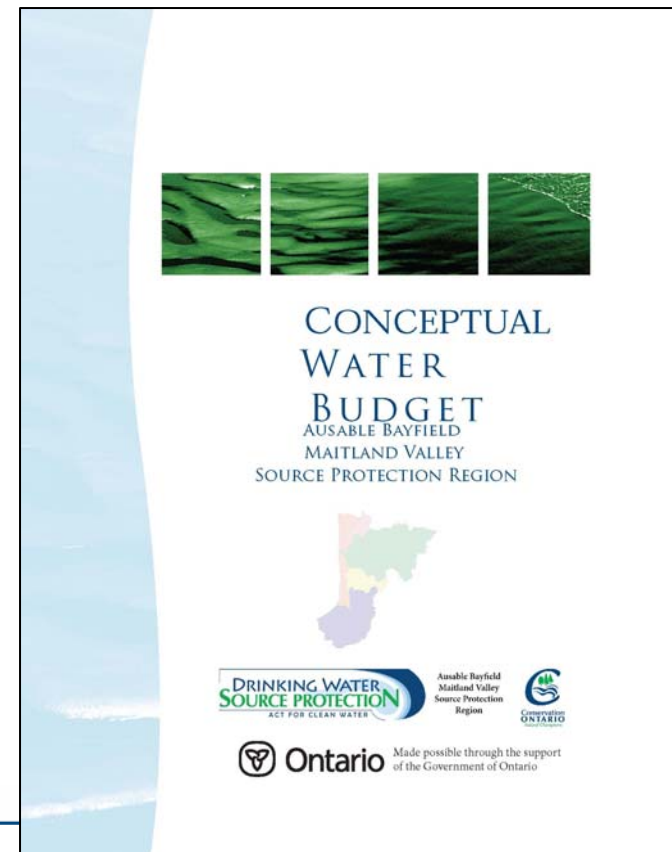
- Understand some potential effects of climate on water budgets
- Recognize the impact of land and water management on water budgets
- Understand effects land cover type, density, management practices have on infiltration, runoff, groundwater and surface water flow

Module Nine: Water Budget in Concept Module Ten: Water Budgets for the Region

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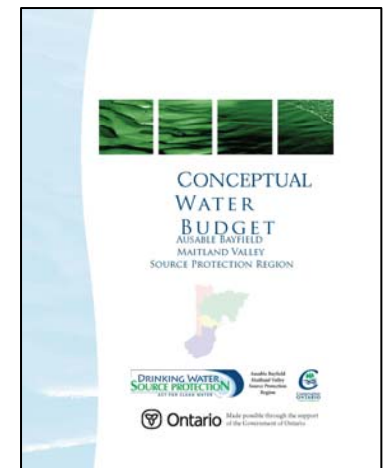
Modules 9 and 10: Water Budget



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DRINKING WATER SOURCE PROTECTION

ACT FOR CLEAN WATER

Ausable Bayfield
Maitland Valley
Source Protection
Region

Test!!!

Modules 9 and 10: Water Budget

Be a 'Rock' Star

- Module 10, page 21

Test!!!

- Open Notebook
- See Module 10, Page 21
- Ask a colleague

DRINKING WATER SOURCE PROTECTION

ACT FOR CLEAN WATER

Ausable Bayfield
Maitland Valley
Source Protection
Region

Be a 'Rock' Star

- Small Group Test
- Learn Lots
- Have fun!



Modules 9 and 10: Water Budget

Be a 'Rock' Star

1) Our region's bedrock dates to the Paleozoic era.

TRUE

FALSE

Be a 'Rock' Star

1) Our region's bedrock dates to the Paleozoic era.

TRUE

FALSE

Be a 'Rock' Star

2) Rocky Balboa is a local geological feature.

TRUE

FALSE

Be a 'Rock' Star

2) Rocky Balboa is a local geological feature.

TRUE

FALSE

Be a 'Rock' Star

3) The Paleozoic Era, which was marked by glaciation, ended 10,000 years ago.

TRUE

FALSE

Be a 'Rock' Star

3) The Paleozoic Era, which was marked by glaciation, ended 10,000 years ago.

TRUE

FALSE

It ended more than 250 million years ago.

Be a 'Rock' Star

4) Barney Rubble married Wilma.

TRUE

FALSE

Be a 'Rock' Star

4) Barney Rubble married Wilma.

TRUE

FALSE

Be a 'Rock' Star

5) The sedimentary rocks, in which bedrock aquifers are located, were laid down in the period of Paleozoic-Pleistocene Non-Conformity.

TRUE

FALSE

Be a 'Rock' Star

5) The sedimentary rocks, in which bedrock aquifers are located, were laid down in the period of Paleozoic-Pleistocene Non-Conformity.

TRUE

FALSE

No – this later period was when bedrock valleys were formed.

DRINKING WATER
SOURCE PROTECTION
ACT FOR CLEAN WATER

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Source Protection
Region

Be a 'Rock' Star

6) Kid Rock is the name of a very young geological feature.

TRUE

FALSE

DRINKING WATER
SOURCE PROTECTION
ACT FOR CLEAN WATER

Ausable Bayfield
Maitland Valley
Source Protection
Region

Be a 'Rock' Star

6) Kid Rock is the name of a very young geological feature.

TRUE

FALSE

Be a 'Rock' Star

7) The period of Paleozoic-Pleistocene
Non-conformity was 300 million years
long.

TRUE

FALSE

Be a 'Rock' Star

7) The period of Paleozoic-Pleistocene
Non-conformity was 300 million years
long.

TRUE

FALSE

Be a 'Rock' Star

8) The Flintstones are famous because they came from the Ausable Bayfield Maitland Valley study area.

TRUE

FALSE

Be a 'Rock' Star

8) The Flintstones are famous because they came from the Ausable Bayfield Maitland Valley study area.

TRUE

FALSE

Be a 'Rock' Star

9) The latest advance/retreat, the Wisconsin Glaciation, is responsible for the deposition of the unconsolidated overburden of the study area.

TRUE

FALSE

Be a 'Rock' Star

9) The latest advance/retreat, the Wisconsin Glaciation, is responsible for the deposition of the unconsolidated overburden of the study area.

TRUE

FALSE

Be a 'Rock' Star

10) Name two types, or categories of aquifers:

a)

b)

Be a 'Rock' Star

10) Name two types, or categories of aquifers:

- a) **Bedrock.**
- b) **Overburden.**

Be a 'Rock' Star

11) Bedrock aquifers are mostly unconfined aquifers (exposed to permeable overburden and often exposed to the surface).

TRUE

FALSE

Be a 'Rock' Star

11) Bedrock aquifers are mostly unconfined aquifers (exposed to permeable overburden and often exposed to the surface).

TRUE

FALSE

Be a 'Rock' Star

12) Bedrock aquifers are the usual source for private wells.

TRUE

FALSE

Be a 'Rock' Star

12) Bedrock aquifers are the usual source for private wells.

TRUE

FALSE

Be a 'Rock' Star

13) Bedrock aquifers are the source of municipal supply for the village of Hensall.

TRUE

FALSE

Be a 'Rock' Star

13) Bedrock aquifers are the source of municipal supply for the village of Hensall.

TRUE

FALSE

Be a 'Rock' Star

14) Bedrock aquifers are a spa resort that Fred and Wilma went to often.

TRUE

FALSE

Be a 'Rock' Star

14) Bedrock aquifers are a spa resort that Fred and Wilma went to often.

TRUE

FALSE

Be a 'Rock' Star

15) Bedrock aquifers are the source of significant discharge for water bodies that are classed as 'cold water fisheries.'

TRUE

FALSE

Be a 'Rock' Star

15) Bedrock aquifers are the source of significant discharge for water bodies that are classed as 'cold water fisheries.'

TRUE

FALSE

Overburden aquifers are the source.

Be a 'Rock' Star

16) Overburden aquifers are generally of two types: Surficial (unconfined) or Confined (e.g., overlain by impermeable clay and/or silt).

TRUE

FALSE

Be a 'Rock' Star

16) Overburden aquifers are generally of two types: Surficial (unconfined) or Confined (e.g., overlain by impermeable clay and/or silt).

TRUE

FALSE

Be a 'Rock' Star

17) Overburden aquifers are often sources of baseflow for many surface water bodies.

TRUE

FALSE

Be a 'Rock' Star

17) Overburden aquifers are often sources of baseflow for many surface water bodies.

TRUE

FALSE

Be a Rock Star

18) Overburden aquifers are aquifers that are reminders that you have too many burdens on you.

TRUE

FALSE

MAYBE

Be a Rock Star

18) Overburden aquifers are aquifers that are reminders that you have too many burdens on you.

TRUE

FALSE

MAYBE

Be a 'Rock' Star

19) Overburden aquifers are in areas of hummocky terrain, infiltration increases and runoff is slowed.

TRUE

FALSE

Be a 'Rock' Star

19) Overburden aquifers are in areas of hummocky terrain, infiltration increases and runoff is slowed.

TRUE

FALSE

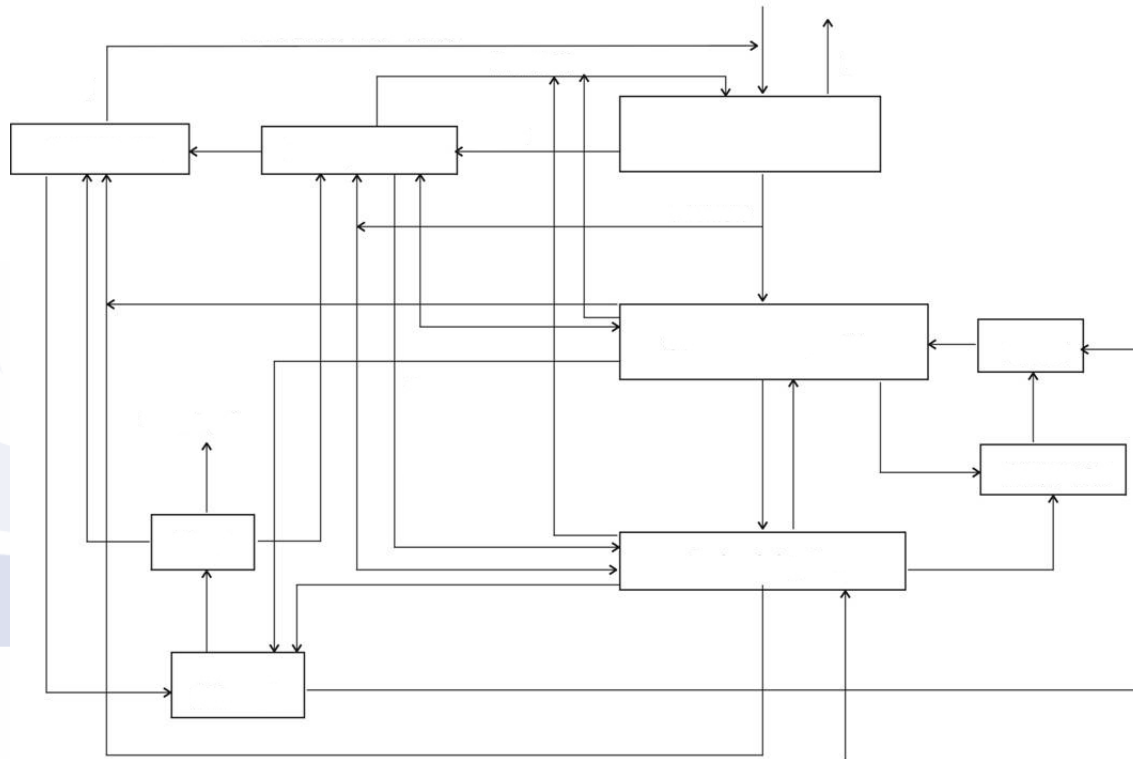
DRINKING WATER
SOURCE PROTECTION
ACT FOR CLEAN WATER

Ausable Bayfield
Maitland Valley
Source Protection
Region

Be a 'Rock' Star

Thanks for playing!

Module Nine: The Water Budget in Concept



Module Nine, Unit One **– Understanding** **a Water Budget**

- What is a water budget?

Water Budget

What is a synonym for Water 'Budget'?

Water Budget

A synonym for Water Budget
is **Water Balance**.

Water Budget

What aspect of water is a water budget most concerned with?

- a) Water Quality
- b) Water Quantity and Supply

Water Budget

What aspect of water is a water budget most concerned with?

a) Water Quality

b) Water Quantity and Supply ...

but, remember, water quantity and water quality are linked ...

Which of these words
do you associate with a
budget?

Joy

Expenses

Astronomy

Intuition

Revenue

Macroeconomics

Candy

Intention

Promotion
Reactive
Balance
Microeconomics
Income
Belief
Planned
Explosion
Allocation
Thespian
Nitrate
Total Phosphorous

It's All About Balance

“Natural watershed systems seek to maintain a balance between precipitation, infiltration to the groundwater system, evaporation from open water surfaces and transpiration from vegetation. This completes the cycle from the atmosphere to the land and back again. It is necessary to understand this balance, or water budget, in order to sustain the resource and its environmental and human interconnections within the watershed.”

Water Budget

- What are some of the water quantity pressures affecting you in your Source Protection Region?
- Your local watershed?

Water Budget



- A water budget is a tool that:

a)

b)

c)

d)

Water Budget



- A water budget is a tool that:
 - a) Helps sets targets for water conservation.
 - b) Helps us establish long-term water supply plans.
 - c) Quantifies water supply and demand.
 - d) Describes the movement of water (pathways).

Water Budget

a) How is water supply **like** a bank account?

b) How is water supply **unlike** a bank account?

Water Budget

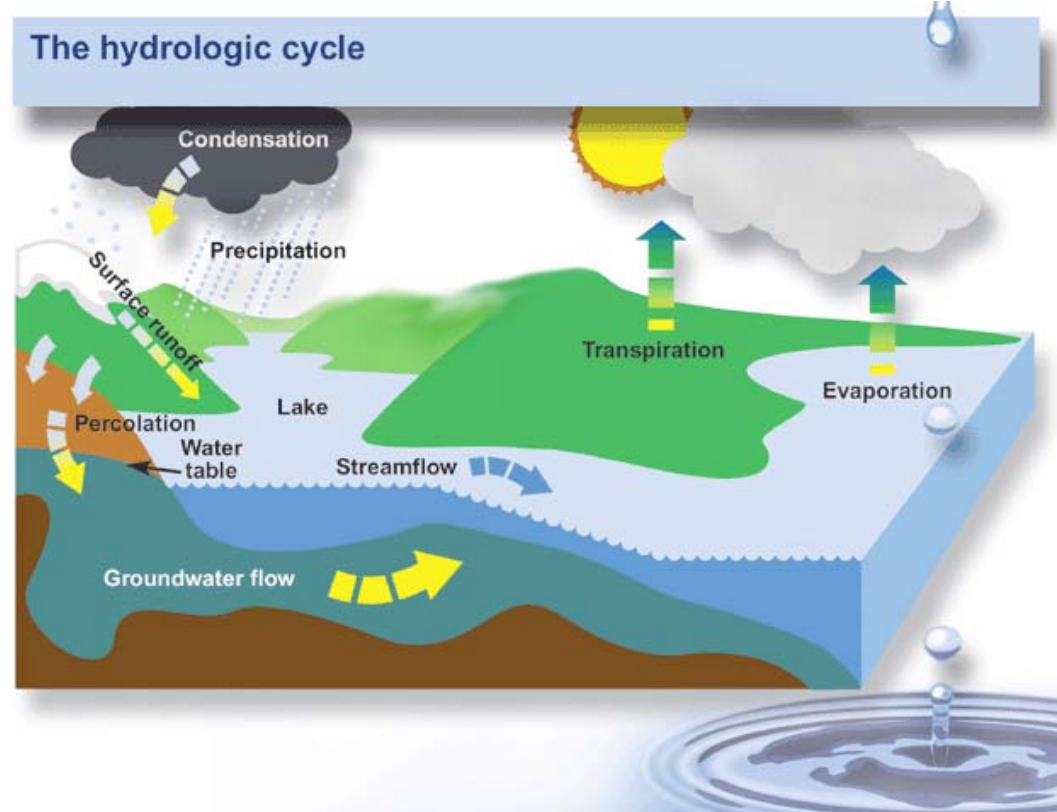
- What things might affect the flow and availability of water?

DRINKING WATER SOURCE PROTECTION

ACT FOR CLEAN WATER

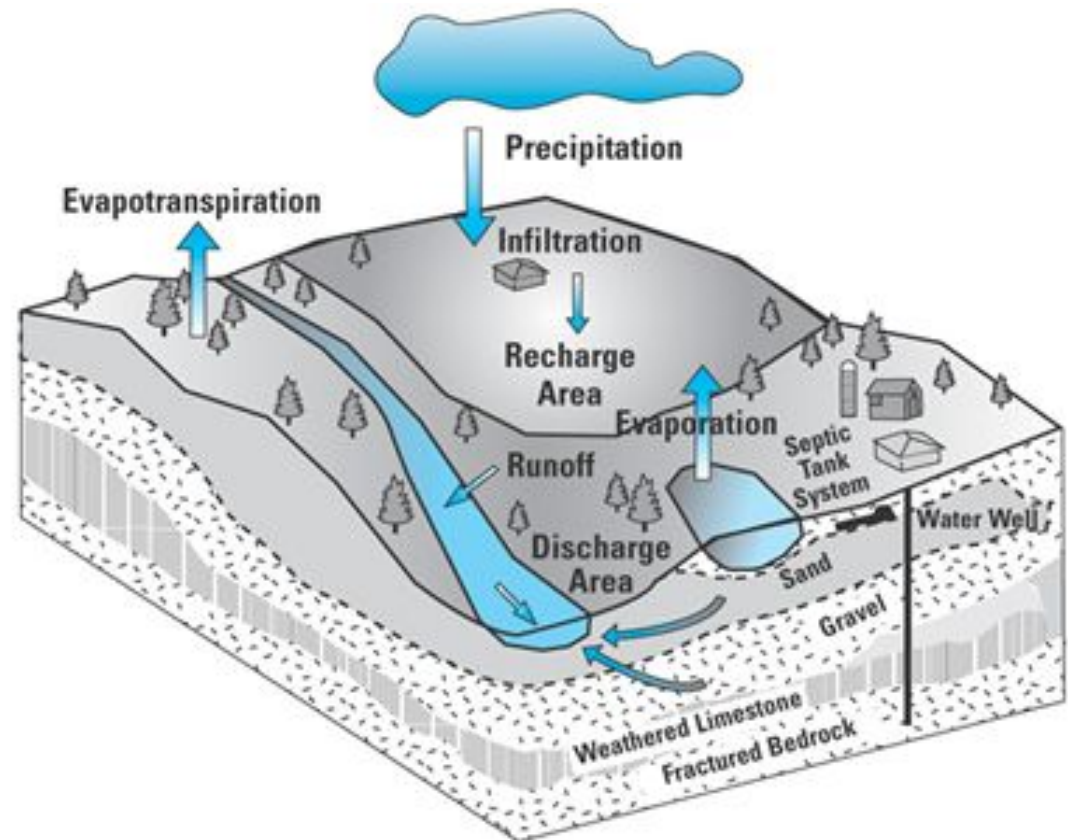
Ausable Bayfield
Maitland Valley
Source Protection
Region

It's All About Balance



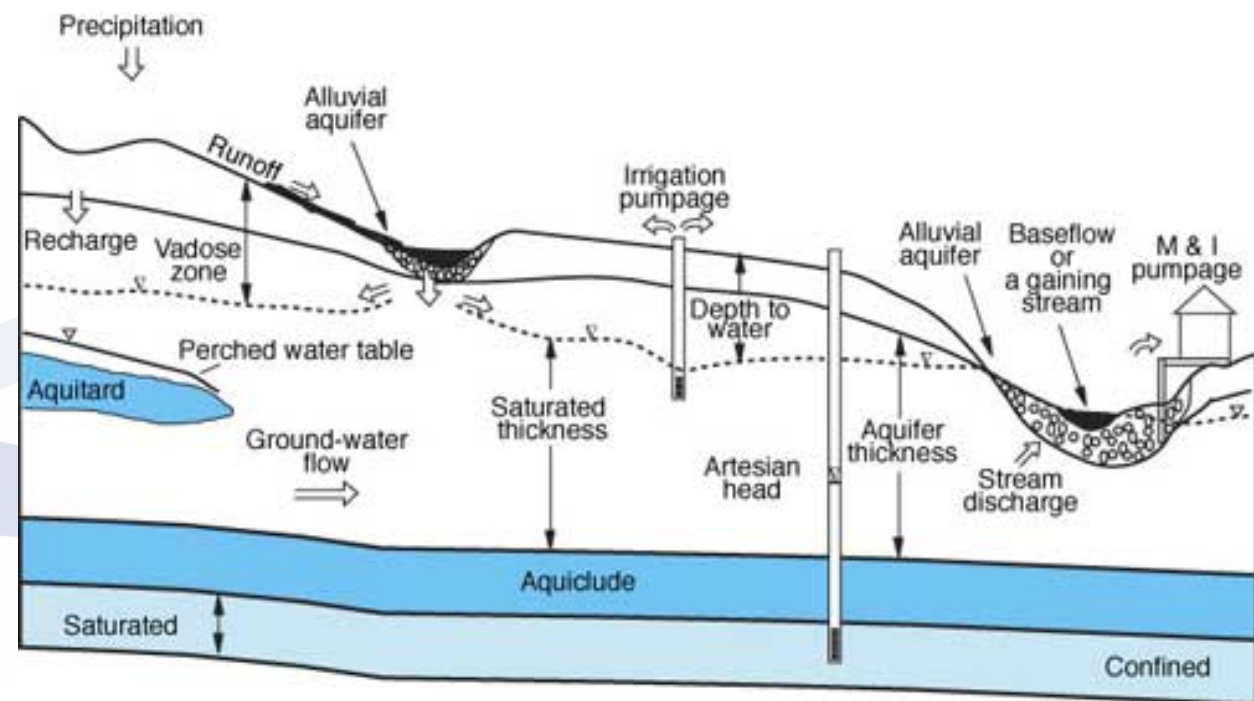
Components and Processes of the Water Cycle

- Precipitation
- Infiltration, Recharge
- Ground surface
- Saturated Zone
- Unsaturated Zone
- Runoff



Components and Processes of the Water Cycle

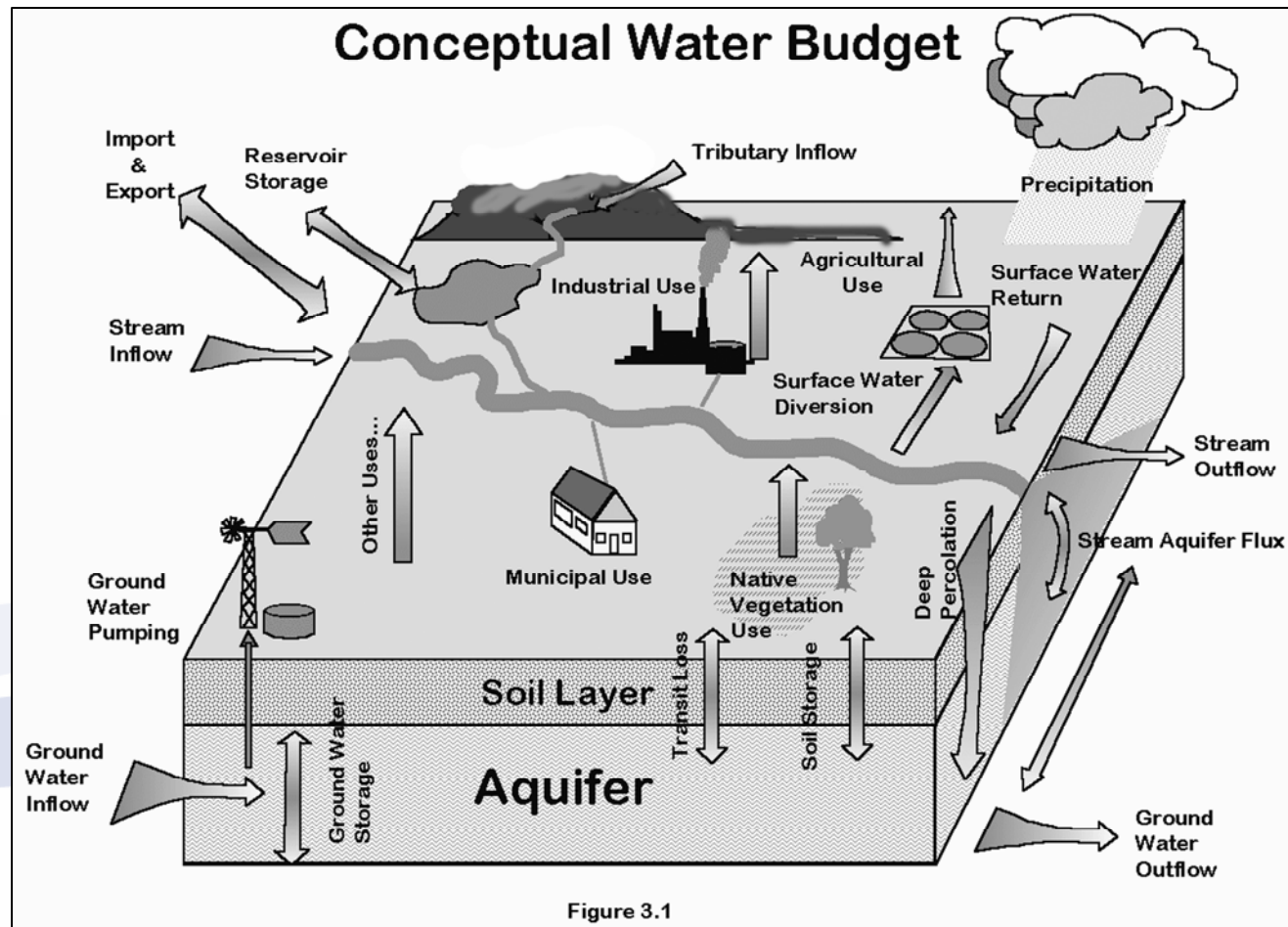
- Evapotranspiration
- Flow
- Water-takings



DRINKING WATER SOURCE PROTECTION

ACT FOR CLEAN WATER

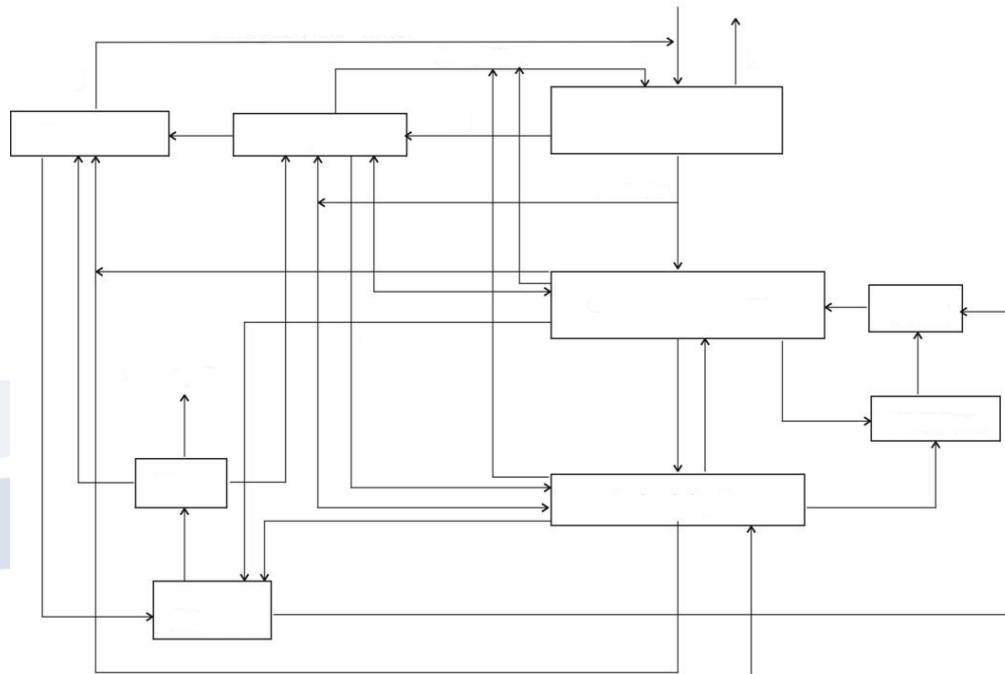
Ausable Bayfield
Maitland Valley
Source Protection
Region



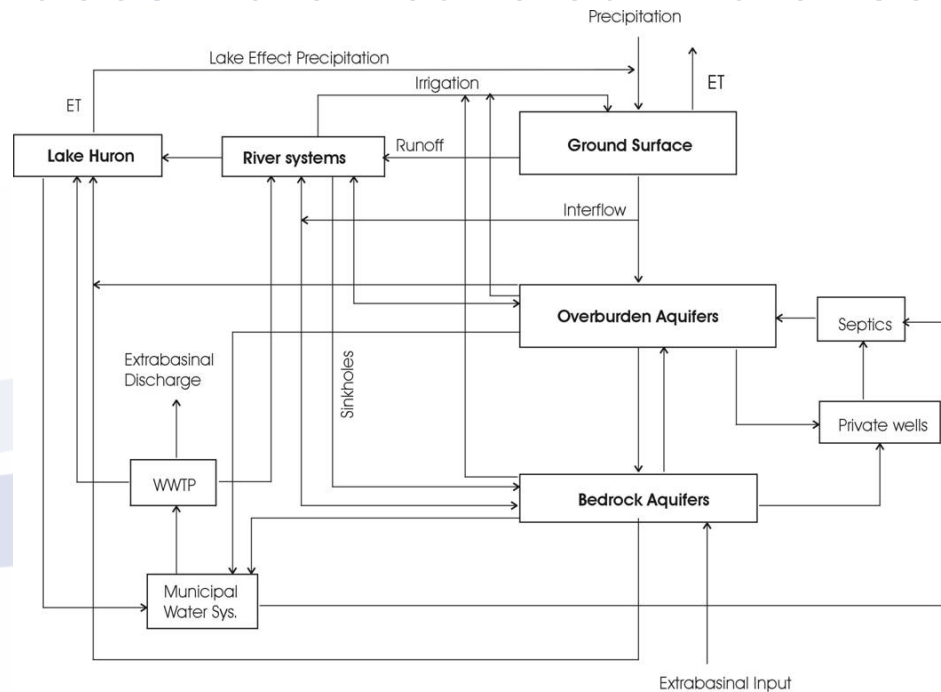
Water Budget

If water is recycled through the Water Cycle and the amount of water in the world theoretically doesn't go up or down – then why are we concerned about water supplies in our Source Protection Region?

What are our main water sources?
Where does water enter our water sources?
How does water leave our water sources?



What are our main water sources? Where does water enter our water sources? How does water leave our water sources?



Our Source Protection Region

- 82 per cent Agricultural cover
- 15 per cent Vegetative cover
- 3 per cent Urban + Industrial

Water Uses

- Municipal
- Agricultural
- Residential
- Industrial
- Commercial
- Recreational

The 4 Quiz

- In small groups answer a Water Budget question that has four answers ...
- (*Consult 'Priming the Pump',*
- *Module 9, Page 17*
- *Module 10, Page 27*)

The 4 Quiz

- What are four main reasons to use the water budget as a tool?

1)

2)

3)

4)

The 4 Quiz

- What are four main reasons to use the water budget as a tool?
 - 1) Helps quantify water supply.
 - 2) Helps quantify water demand.
 - 3) Describes water's movement and pathways.
 - 4) Helps appreciate current stresses on water supply.
- Other?

The 4 Quiz

- What are the four major aspects of a water budget?

1)

2)

3)

4)

The 4 Quiz

- What are the **four major aspects** of a water budget?
 - 1) Characterization of surface water system + subsystems such as climate, infiltration
 - 2) The Groundwater System – Geology, Hydrogeology, Aquifer characteristics
 - 3) Connection between surface and groundwater systems.
 - 4) Water use.

The 4 Quiz

- What are the four questions a water budget answers?

1)

2)

3)

4)

The 4 Quiz

- What are the four questions a water budget answers?
 - 1) Where is the water?
 - 2) How does water move? (Pathways)
 - 3) What are the stresses? (Water takings)
 - 4) What are the trends (Decreases?)?

The 4 Quiz

- What are four factors in answering water budget questions?

1)

2)

3)

4)

The 4 Quiz

- What are are four factors in answering water budget questions?
 - 1) What quantities of water exist in reservoirs of hydrologic cycle? (e.g., water withdrawals, returns).
 - 2) What are pathways and what changes to pathways?
 - 3) What are recharge, discharge, potential water sources?
 - 4) Is there evidence of cycle change? – climate, land use, etc.

The 4 Quiz

- What are four steps in preparing a water budget?

1)

2)

3)

4)

The 4 Quiz

- What are four steps in preparing a water budget?
 - 1) Identifying key components and processes of hydrologic system.
 - 2) Understanding interconnections of components and processes.
 - 3) Quantifying the fluxes.
 - 4) Preparing the water budget.

The 4 Quiz

- What are the four components of water budget process?

1)

2)

3)

4)

The 4 Quiz

- What are the four components of water budget process?
 - 1) Atmosphere.
 - 2) Ground Surface.
 - 3) Unsaturated Zone.
 - 4) Saturated Zone.

Water Budget

What is the purpose of
a water budget?

Water Budget

- a) Helps sets targets for water conservation.
- b) Helps us establish long-term water supply plans.
- c) Quantifies water supply and demand.
- d) Describes the movement of water (pathways).

Water Budget

- What is meant by the old saying “the solution to pollution is dilution”?
 - a) What is **true** about that statement?
 - b) What is **untrue** about that statement?

Module Nine, Unit Two

– Water Budgets in the Ausable Bayfield Maitland Valley Source Protection Region

- How do we use water budgets in our Source Protection Region?

Water Budget

- Which is the greater concern in our region – water quantity or water quality?

a) Water Quantity, or;

b) Water Quality

Why?

What are the two major types of aquifers?

a)

b)

What are the two major types of aquifers?

- a) Bedrock
- b) Overburden

Which is the most important groundwater source for drinking water?

- a) Bedrock
- b) Overburden

Which is the most important groundwater source for drinking water?

- a) **Bedrock**
- b) **Overburden**

Which is the most important
groundwater source for drinking
water?

a) Bedrock

Why?

Can you name a location in the region that gets its water from an overburden aquifer?

Can you name a location in the region that gets its water from an overburden aquifer?

Hensall

Water Budget

Module 9,

Page 13

- What are the five main watershed systems in our Source Protection Region?
 - a)
 - b)
 - c) Maitland River
 - d)
 - e)

Water Budget

Module 9,

Page 13

- How much of the region is drained by the following river systems?
 - a) Ausable River
 - b) Bayfield River
 - c) Maitland River
 - d) Nine Mile River
 - e) Shore Streams, Gullies

Water Budget

Module 9,
Page 13

- How much of the region is drained by the following river systems?
 - a) Ausable – 21.6%
 - b) Bayfield R. – 8.7%
 - c) Maitland – 45.1%**
 - d) Nine Mile R. – 4.3%
 - e) Shore Streams, Gullies – 20.3%

Module 10, Unit One

– Will our water supply be enough tomorrow?

- Climate Change and Variability
- Different uses of water

Water Budget

- What is the Water Quantity Risk Assessment process?

Water Budget

- Why is the water budget used in the Water Quantity Risk Assessment process?

Water Budget

One of the goals of the Clean Water Act, 2006, is to eliminate drinking **water** threats defined as an activity or condition that adversely affects or has the potential to adversely affect, the quality or **quantity** of any **water** that is or may be used as a source of drinking **water**. Locally derived, science-based source protection and **risk assessment** plans are key aspects of the CWA.

Module 10,
Unit Two
– The Groundwater System
(Geology 101, Hydrogeology 101)

- Hydrogeology and the Groundwater System
- Bedrock Aquifers
- Overburden Aquifers
- Interaction between bedrock and overburden aquifers; groundwater and surface water

Module 10, Unit Three **– The Surface Water System**

- Climate
- Land cover
- Soil
- Infiltration
- Runoff and stream flow
- Baseflow

Bedrock Aquifers are the source of municipal drinking water in Hensall

- True or False?

DRINKING WATER SOURCE PROTECTION

ACT FOR CLEAN WATER

Ausable Bayfield
Maitland Valley
Source Protection
Region



Modules 9 and 10: Water Budget

Water Budget

- How many confined overburden aquifers are there in the region?

Module Nine: Water Budget
Module Ten: Water Budgets for the Region

Section Two – Priming the Pump

- See Modules
9,10

DRINKING WATER SOURCE PROTECTION

ACT FOR CLEAN WATER

Ausable Bayfield
Maitland Valley
Source Protection
Region

Thank you!

- Any questions?



Piezometric Surface

- Definition:
 - **piezometric surface**—The imaginary surface that everywhere coincides with the piezometric head of the water in the aquifer. In areas of artesian groundwater it is above the land surface. [SOURCE: American Meteorological Society].
 - **PIEZOMETRIC SURFACE** - The water level surface that can be defined from the mapping of water level elevations in wells tapping into a confined aquifer. [SOURCE: Lifewater Canada].

Water Budget

- Name five main watershed systems in our Source Protection Region.

1)

2)

3)

4)

5)

Water Budget

- What communities in the region may face water quantity challenges?
 - a) ...
 - b) ...
 - c) ...

Water Budget

- How are water budgets used in the region?

Water Budget

- What are the main water uses in the region?
 - a) ...
 - b) ...
 - c) ...
 - d) ...

Water Budget

- How many chemical compounds have been identified in the Great Lakes?
 - A) More than 120
 - B) More than 360
 - C) More than 700

Water Budget

- What two major types of aquifers are there in the region?

1) ...

2) ...

Water Budget

- What increased demands do you see for water use in our region?

Water Budget

- How many surficial overburden aquifers are there in the region?

Water Budget

- Why are shallow overburden aquifers important?